



To: Mr. Scott Sintkowski, PE  
Road Commission for Oakland County

Re: Redwood – Rochester Hills, MI  
Access Evaluation

From: Timothy J. Likens, PE, PTOE  
Transportation Engineer

Date: March 22, 2019

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## INTRODUCTION

This memorandum presents the results of an access evaluation for the proposed Redwood residential project in the City of Rochester Hills, Oakland County, Michigan. The project site is located in an area near the southwest quadrant of the Avon Road & Dequindre Road intersection and is currently vacant. The proposed development would include 120 single-story residential units with attached garages with site access provided via one access point to Avon Road and one access point to Dequindre Road. Avon Road and Dequindre Road are under the jurisdiction of the Road Commission for Oakland County (RCOC), and the site plan is subject to City approval.

As noted below in **Table 1**, the proposed land use and density will not generate traffic volumes in excess of 50 directional trips per hour, which typically triggers the requirement to analyze site access or off-site intersections as published in *Evaluating Traffic Impact Studies*. Additionally, RCOC has indicated they are currently in the process of planning for a project to improve the intersection of Avon Road & Dequindre Road. Therefore, no capacity analysis is required relative to site access operations or impacts to the adjacent road network associated with this project; however, the City and RCOC have requested a center left turn lane (CLTL) and right turn treatments at the proposed site access points to Avon Road and Dequindre Road as a requirement for project approval.

The purpose of this study is therefore to determine if auxiliary lanes are warranted at the proposed site access points in accordance with RCOC standards. The scope of this study was developed based on the requirements of RCOC and the City, as established via email communications with RCOC between February 25<sup>th</sup> to 28<sup>th</sup>, 2019.

## EXISTING DATA

Dequindre Road and Avon Road are Principal Arterials under RCOC jurisdiction. In the vicinity of the site, Dequindre Road has a posted speed limit of 45 miles per hour (mph) and carries approximately 14,500 vehicles per day, while Avon Road has a posted speed limit of 40 mph and carries approximately 17,800 vehicles per day. These daily volumes were determined based on SCATS data provided by RCOC and generally available data published by the Southeast Michigan Council of Governments (SEMCOG). The study section of Dequindre Road and Avon Road have typical two-lane cross sections with one lane in each direction.

Existing traffic volume data for the intersection of Avon Road & Dequindre Road were obtained from RCOC from the SCATS traffic signal system. The SCATS system detects and records the volume of vehicles in each lane group at a particular intersection (left, through, right) in one-hour intervals.



Data for the intersection of Avon & Dequindre were provided for a Tuesday, Wednesday, or Thursday of a non-holiday week while schools were in session. In order to eliminate the potential for daily and seasonal fluctuations in traffic volume that may occur, these data were provided for 12 separate days throughout the months of September, October, and January. Review of these data indicates that the intersection experiences an average Total Entering Volume (TEV) of approximately 26,200 vehicles per day. During this time period, the intersection experienced a peak daily TEV of 28,100 vehicles. This volume was referenced for the access evaluation to determine if warranting criteria would be met not only in average conditions, but conservatively during peak conditions.

Where shared lanes (i.e. shared through and left turn movement from a single lane) exist, the SCATS system is not capable of recording the volume of through versus turning traffic. As the WB Avon approach at this intersection is a shared through / left turn lane, through versus turning movements were calculated by volume balancing WB and SB approach counts on Avon Road and Dequindre Road at John R Road and Hamlin Road, respectively, with the SCATS approach counts for the NB and EB approaches at the intersection of Avon Road & Dequindre Road.

The results indicate that approximately 55% of WB traffic during the AM peak hour and 60% during the PM Peak hour proceed through the intersection to continue west on Avon Road, while the remaining traffic turns left to travel south on Dequindre Road. Additionally, 60% of daily WB Avon approach traffic through the intersection continues west on Avon Road. These percentages were applied to the SCATS WB approach counts to calculate the AM and PM peak hours turning movements at the intersection for use in determining a trip distribution model for the proposed development as well as 24-hour counts on Avon Road and Dequindre Road utilized in the auxiliary lane warrant analysis. The resulting traffic volumes are summarized on the attached **Figure 1**.

## BACKGROUND VOLUMES

Typically, an ambient growth factor is applied to existing traffic volumes to account for future projects in the study area and population increases, as well as growth in regular traffic volumes due to development projects outside the study area. In order to determine the applicable traffic growth rate for the existing traffic volumes, the SEMCOG community profile for Rochester Hills was referenced. This data indicates a 0.33% annual increase in population and 0.30% increase in employment to the year 2045. Therefore, Consistent with MDOT practice for other projects in SE Michigan, a background growth rate of 0.5% per year was applied to the 2018 traffic volumes for a period of three years. The resulting traffic volumes for the projected buildout year of 2021 are shown on the attached **Figure 1**.

## TRIP GENERATION AND ASSIGNMENT

The number of AM and PM peak hour vehicle trips that would be generated by the proposed development was forecast based on the rates and equations published by ITE in *Trip Generation, 10<sup>th</sup> Edition*. ITE publishes average trip generation rates for a wide variety of land uses, as well as regression equations for some. For some land uses, both rates and equations are available, and



selection of the appropriate method was based on the guidelines outlined in the ITE *Trip Generation Manual*. The resulting trip generation forecast is summarized in **Table 1**.

**Table 1: Site Trip Generation**

Land Use	ITE Code	Units	Average Daily	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
Multifamily Low-Rise	220	120	866	13	44	57	43	26	69

It should be noted that the characteristics of this development are not explicitly reflected by the land use categories published by ITE. With a majority demographic of residents over age 55, this development will likely generate less trips than a typical multifamily development. As part of a previous Traffic Impact Study, three similar Redwood Living sites were surveyed consistent with ITE recommended practice. The results of this trip generation study indicate that this development can be expected to generate 0.35 trips per unit during the AM peak hour, and 0.44 trips per unit during the PM peak hour, resulting in approximately 25% less trips as compared to the ITE data summarized in Table 1. However, as a conservative approach and per the request of RCOC and the City, ITE data was utilized in this study.

The vehicle trips that would be generated by the proposed development were assigned to the study road network based on existing traffic patterns and ITE methodologies which indicate that new trips will return to their direction of origin. Existing traffic patterns are assumed to reflect the gravity of origins and destinations relative to the study area. The resulting distribution for site-generated traffic is summarized in **Table 2** and the resultant traffic assignments are shown on the attached **Figure 1**.

**Table 2: Site Trip Distribution**

To/From	Via	AM	PM
South	Dequindre Road	35%	40%
East	Avon Road	25%	30%
West	Avon Road	40%	30%
		<b>100%</b>	<b>100%</b>

With access on both Avon Road and Dequindre Road, traffic to/from the south and west were assumed to not travel through the traffic signal at Avon Road & Dequindre Road. Traffic volumes approaching / departing to the east were assumed to evenly utilize the driveways along both roadways based on the site layout and proposed site access locations.

The site-generated vehicle trips from the Redwood Development were applied to the 2021 background traffic volumes to forecast the future traffic volumes with the proposed Redwood development. These projected future peak hour traffic volumes are shown on the attached **Figure 1**.

**AUXILIARY LANE ANALYSIS**

In order to determine the configuration of the proposed site access points with Avon Road and Dequindre Road, warrants for auxiliary lanes were evaluated in accordance with Rule 6.7 of the RCOC *Permit Specifications and Guidelines*. This analysis is based on the forecast site traffic volume



assignments versus 24-hour volumes on Avon Road and Dequindre Road. The results of this analysis indicate a left turn treatment is warranted at the Dequindre Road access point while a right-turn treatment is warranted at the Avon Road access point as summarized in Table 3. No other auxiliary lane treatments are warranted. The applicable warrant graphs are attached.

**Table 3: Auxiliary Lane Warrant Analysis Summary**

Access Point	2021 24-Hour Volume	Peak Ingress Lefts	Peak Ingress Rights	Left-Turn Treatment Warranted	Right-Turn Treatment Warranted
Avon	18,479	7	13	No	Yes - Taper Only
Dequindre	15,103	17	6	Yes	No

Regardless of the warranting criteria, RCOC has indicated challenges with topography that may preclude widening Avon Road to provide a center left turn lane at the proposed site access point. An alternative offered by RCOC would be to construct the Avon access as a right-in / right-out driveway. In this case, the driveway assignments shown on Figure 1 would be altered slightly to reassign traffic to the Dequindre Road access. The resultant assignment would require a right turn taper at the Dequindre Road access point, as shown on Table 4.

**Table 4: Auxiliary Lane Warrant Analysis Summary - No Left Turn Ingress at Avon Access**

Access Point	2021 24-Hour Volume	Peak Ingress Lefts	Peak Ingress Rights	Left-Turn Treatment Warranted	Right-Turn Treatment Warranted
Avon	18,479	N/A	13	N/A	Yes - Taper Only
Dequindre	15,103	17	13	Yes	Yes - Taper Only

**SIGHT DISTANCE**

Rule 6.2 of the RCOC *Permit Specifications and Guidelines* define the clear vision areas and sight distance requirements for driveway and private road approaches. Sight Distance exhibits have been prepared and are submitted with the project site plan in accordance with RCOC requirements. These exhibits indicate that some tree / brush clearing may be required to provide minimum required sight distance. At both access points, sight distance will be adequate to see vehicles approaching from the signalized intersection of Avon Road & Dequindre Road.

**CONCLUSIONS**

Based on the RCOC warranting criteria outlined under Rule 6.7 of the *Permit Specifications and Guidelines*, the volumes experienced at the proposed site access point to Avon Road would not warrant a left-turn treatment; however, a right-turn taper is warranted. At the proposed site access point to Dequindre Road, a left-turn treatment is warranted. These results are based on the following assumptions which provide a conservative analysis:



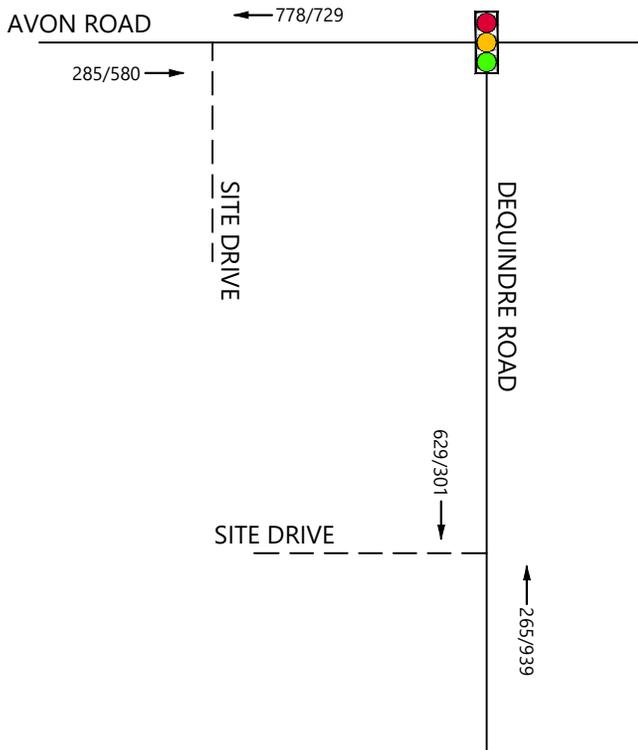
- Use of traffic volumes from the peak day of 12 separate days at the intersection of Avon Road & Dequindre which are nearly 2,000 vehicles per day (7%) higher than the average of all 12 days.
- Use of ITE data for calculation of site-generated trips from the development which is approximately 25% higher than calculated trip generation rates specific to the proposed Redwood development.

In the case that RCOC does not permit left turn ingress on Avon Road, absent of a center lane for left turns, additional volume can be expected to utilize the Dequindre access point from the north and east. The resulting traffic volumes would warrant a right-turn taper on Dequindre Road.

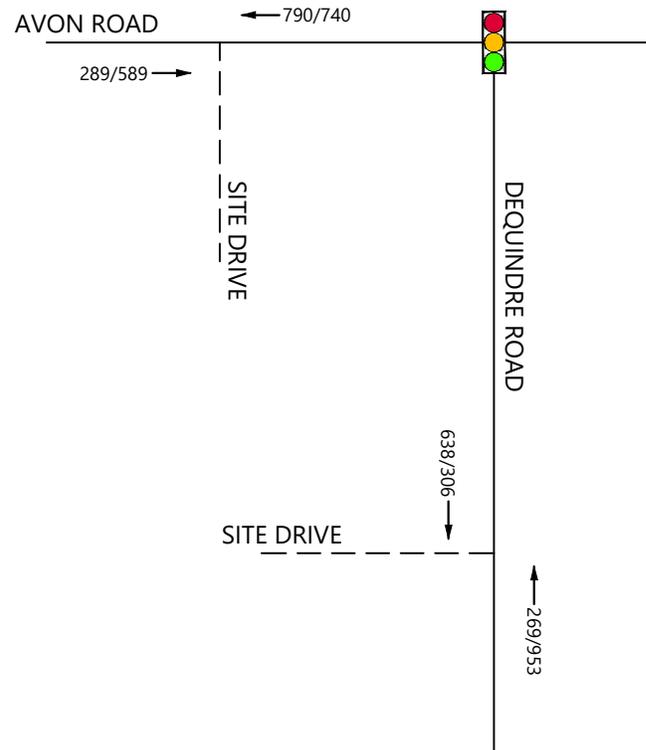
The referenced traffic data, calculations, and results are attached. Please direct any questions regarding this memorandum to Bergmann.

**Attached:** Figure 1  
Traffic Volume Data  
RCOC Turn Lane Warrants

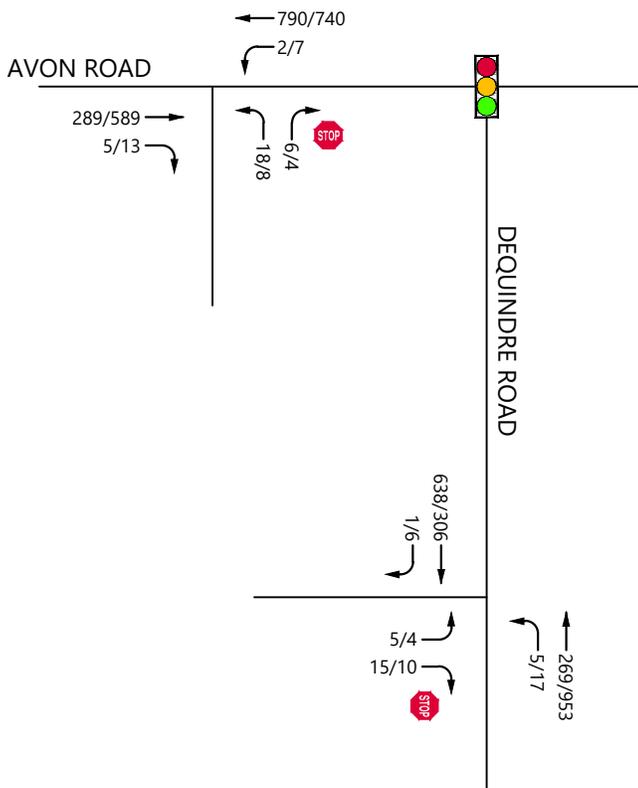
## EXISTING



## BACKGROUND

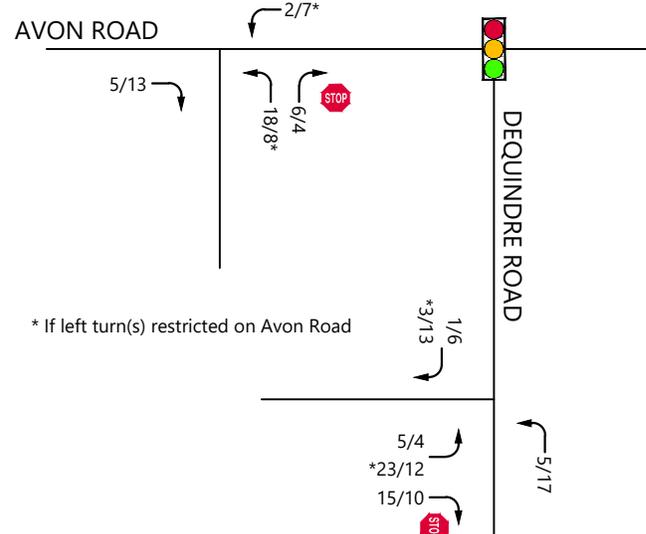


## FUTURE



###/### AM/PM PEAK HOUR VOLUME

## SITE-GENERATED



\* If left turn(s) restricted on Avon Road

### Proposed Redwood Development City of Rochester Hills, MI

Figure 1  
Traffic Volumes

PAGE NO.	SCALE	DATE	
-	No Scale	Mar '19	

Date	Movement	7:00 AM	8:00 AM	4:00 PM	5:00 PM	Daily	Intersection Total
9/11/2018	WB LT/Thru	1239	1169	675	690	12217	27949
	EB Thru	237	251	598	605	6572	
	EB RT	52	52	22	77	1055	
	NB LT	92	134	311	297	3140	
	NB RT	168	220	414	392	4965	
9/12/2018	WB LT/Thru	1266	1144	666	770	12122	26988
	EB Thru	228	252	362	565	5986	
	EB RT	59	54	8	31	1034	
	NB LT	68	108	234	333	2959	
	NB RT	132	228	338	539	4887	
9/13/2018	WB LT/Thru	1262	1134	692	718	12081	28134
	EB Thru	224	270	556	535	6404	
	EB RT	61	47	24	22	1099	
	NB LT	84	109	314	281	2999	
	NB RT	181	220	625	561	5551	
10/16/2018	WB LT/Thru	1186	1082	680	711	12074	27310
	EB Thru	227	266	485	463	6154	
	EB RT	81	71	18	73	1272	
	NB LT	73	167	332	274	3021	
	NB RT	176	211	456	465	4789	
10/17/2018	WB LT/Thru	1150	1097	630	7169	11800	27395
	EB Thru	249	284	521	520	6263	
	EB RT	93	97	20	30	1213	
	NB LT	68	103	217	221	2782	
	NB RT	174	198	636	571	5337	
10/18/2018	WB LT/Thru	1193	1057	694	696	12060	27612
	EB Thru	239	269	494	502	6286	
	EB RT	75	88	23	175	1503	
	NB LT	77	96	278	309	3065	
	NB RT	162	207	415	419	4698	
1/8/2019	WB LT/Thru	1232	983	672	640	10810	24948
	EB Thru	231	217	540	563	5567	
	EB RT	79	49	31	72	1082	
	NB LT	95	95	211	253	2585	
	NB RT	171	195	615	541	4904	
1/9/2019	WB LT/Thru	1149	1082	564	652	10706	25077
	EB Thru	223	247	553	527	5473	
	EB RT	67	52	38	93	1301	
	NB LT	105	96	243	290	2794	
	NB RT	162	203	613	550	4803	
1/10/2019	WB LT/Thru	1161	1115	638	657	10691	25146
	EB Thru	217	220	550	547	5565	
	EB RT	92	61	37	105	1734	
	NB LT	95	85	185	290	2590	
	NB RT	151	198	612	556	4566	
1/15/2019	WB LT/Thru	1251	1054	628	621	10715	24705
	EB Thru	219	237	602	554	5600	
	EB RT	80	57	30	44	942	
	NB LT	91	95	202	241	2626	
	NB RT	155	181	611	565	4822	
1/16/2019	WB LT/Thru	1166	1058	623	662	10908	24745
	EB Thru	205	218	583	512	5366	
	EB RT	68	51	35	DA	1265	
	NB LT	86	81	188	227	2707	
	NB RT	140	201	511	528	4499	
1/17/2019	WB LT/Thru	1221	1105	648	706	10763	24789
	EB Thru	215	236	522	557	5671	
	EB RT	78	52	38	41	875	
	NB LT	80	91	239	264	2722	
	NB RT	160	196	643	516	4758	

AVON ROAD & DEQUINDRE ROAD SCATS TRAFFIC VOLUME SUMMARY							
Date	Movement	7:00 AM	8:00 AM	4:00 PM	5:00 PM	Daily	Intersection Total
9/13/2018	WB LT/Thru	1262	1134	692	718	12081	28134
	EB Thru	224	270	556	535	6404	
	EB RT	61	47	24	22	1099	
	NB LT	84	109	314	281	2999	
	NB RT	181	220	625	561	5551	

WB APPROACH PEAK HOUR TRAFFIC VOLUME CALCULATIONS				
TIME	WB AVON @JOHN R	SB DEQUINDRE @ HAMLIN	% AVON	% DEQUINDRE
7:00 AM	799	701	53%	47%
8:00 AM	693	512	58%	42%
4:00 PM	618	322	66%	34%
5:00 PM	612	383	62%	38%
24-HOUR	9537	6295	60%	40%

AVON & DEQUINDRE PEAK HOUR TURNING MOVEMENT COUNTS						
Time Period	WB		EB		NB	
	LEFT	THRU	THRU	RIGHT	LEFT	RIGHT
AM PEAK	568	694	224	61	84	181
PM PEAK	277	415	556	24	314	625

AVON & DEQUINDRE 24-HOUR CALCS	
ROAD	VOLUME
AVON	17779
DEQUINDRE	14453

DISTRIBUTION CALCS							
DIRECTION	AM		PM		DIRECTION		TOTAL
	TO	FROM	TO	FROM	TO	FROM	
SOUTH	629	265	301	939	SOUTH	14%	42%
EAST	405	1262	1181	692	EAST	53%	31%
WEST	778	285	729	580	WEST	33%	26%
TOTAL	1812	1812	2211	2211	TOTAL	100%	100%

# Community Profiles

YOU ARE VIEWING DATA FOR:

## City of Rochester Hills

1000 Rochester Hills Dr  
Rochester Hills, MI 48309-3033  
<http://www.rochesterhills.org>

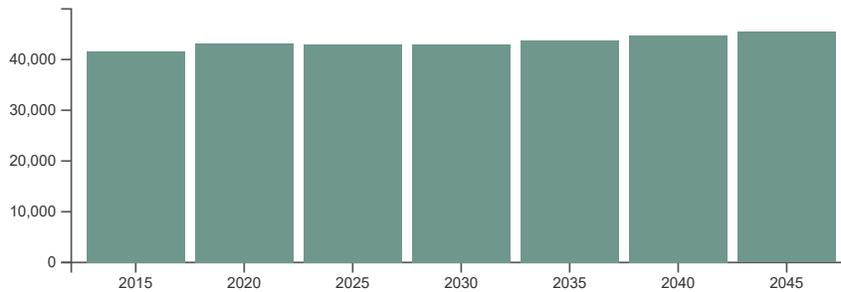


Census 2010 Population: 70,995  
Area: 32.9 square miles

### Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year**  **Economic**

#### Forecasted Jobs



Source: SEMCOG 2045 Regional Development Forecast

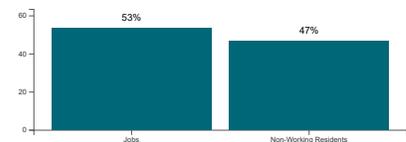
## Forecasted Jobs by Industry Sector

Forecasted Jobs By Industry Sector	2015	2020	2025	2030	2035	2040	2045	Change 2015-2045	Pct Change 2015-2045
<b>Natural Resources, Mining, &amp; Construction</b>	1,755	2,005	1,907	1,886	1,911	1,938	1,967	212	12.1%
<b>Manufacturing</b>	5,018	4,705	4,429	4,098	3,886	3,704	3,505	-1,513	-30.2%
<b>Wholesale Trade</b>	1,437	1,484	1,482	1,465	1,465	1,464	1,454	17	1.2%
<b>Retail Trade</b>	6,186	6,284	5,952	5,927	5,740	5,662	5,599	-587	-9.5%
<b>Transportation, Warehousing, &amp; Utilities</b>	699	723	721	719	730	743	756	57	8.2%
<b>Information &amp; Financial Activities</b>	3,877	4,008	3,960	3,911	3,955	3,973	3,952	75	1.9%
<b>Professional and Technical Services &amp; Corporate HQ</b>	3,552	3,647	3,850	4,080	4,551	5,061	5,412	1,860	52.4%
<b>Administrative, Support, &amp; Waste Services</b>	3,708	3,835	3,885	3,906	3,992	4,080	4,134	426	11.5%
<b>Education Services</b>	2,261	2,377	2,375	2,363	2,389	2,419	2,449	188	8.3%
<b>Healthcare Services</b>	6,774	7,303	7,578	7,758	8,230	8,705	9,124	2,350	34.7%
<b>Leisure &amp; Hospitality</b>	3,951	4,433	4,527	4,572	4,660	4,776	4,818	867	21.9%
<b>Other Services</b>	1,982	2,041	1,993	1,956	1,950	1,937	1,910	-72	-3.6%
<b>Public Administration</b>	359	361	359	354	354	351	351	-8	-2.2%
<b>Total Employment Numbers</b>	41,559	43,206	43,018	42,995	43,813	44,813	45,431	3,872	9.3%

Source: SEMCOG 2045 Regional Development Forecast

## Daytime Population

Daytime Population	SEMCOG and ACS 2015
Jobs	41,559
Non-Working Residents	36,257
Age 15 and under	14,348
Not in labor force	19,738
Unemployed	2,171
<b>Daytime Population</b>	<b>77,816</b>



Source: SEMCOG 2045 Regional Development Forecast and 2015 American Community Survey 5-Year Estimates

Note: The number of residents attending school outside Southeast Michigan is not available.

Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

# Community Profiles

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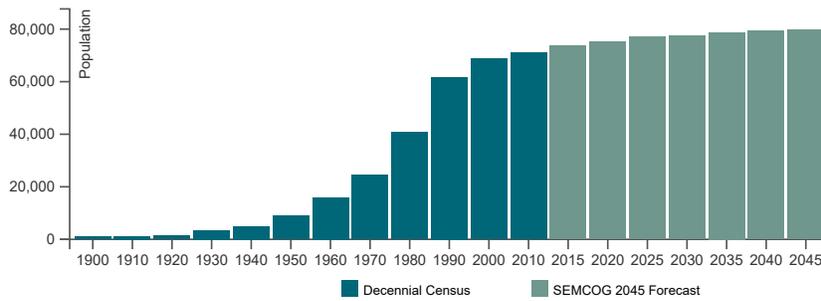


Census 2010 Population:  
70,995  
Area: 32.9 square miles

### Population and Households

Link to American Community Survey (ACS) Profiles: **Select a Year**  **Social | Demographic**  
**Population and Household Estimates for Southeast Michigan, 2018**

### Population Forecast



Note for City of Rochester Hills : Incorporated in 1984 from Avon Charter Township. Population numbers prior to 1984 are of the township.

## Population and Households

Population and Households	Census 2010	Change 2000-2010	Pct Change 2000-2010	SEMCOG Jul 2018	SEMCOG 2045
<b>Total Population</b>	70,995	2,170	3.2%	74,556	79,709
<b>Group Quarters Population</b>	1,181	398	50.8%	1,112	1,494
<b>Household Population</b>	69,814	1,772	2.6%	73,444	78,215
<b>Housing Units</b>	29,494	2,231	8.2%	30,595	-
<b>Households (Occupied Units)</b>	27,578	1,263	4.8%	29,155	32,471
<b>Residential Vacancy Rate</b>	6.5%	3.0%	-	4.7%	-
<b>Average Household Size</b>	2.53	-0.05	-	2.52	2.41

Source: U.S. Census Bureau, SEMCOG Population and Household Estimates, and SEMCOG 2045 Regional Development Forecast

## Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2015 Avg.
<b>Natural Increase (Births - Deaths)</b>	384	233	194
<b>Births</b>	950	755	750
<b>Deaths</b>	566	522	556
<b>Net Migration (Movement In - Movement Out)</b>	-368	185	351
<b>Population Change (Natural Increase + Net Migration)</b>	16	418	545

Source: Michigan Department of Community Health Vital Statistics, U.S. Census Bureau, and SEMCOG



# Volume Count Report

LOCATION INFO	
Location ID	2235
Type	LINK
Funct'l Class	-
Located On	AVON
From Road	JOHN R
To Road	DEQUINDRE
Direction	2-WAY
County	Oakland
Community	Rochester
MPO ID	2505
HPMS ID	
Agency	Oakland County

COUNT DATA INFO	
Count Status	Accepted
Start Date	Tue 5/19/2015
End Date	Wed 5/20/2015
Start Time	11:00:00 AM
End Time	11:00:00 AM
Direction	
Notes	
Station	FO376_____
Study	
Speed Limit	
Description	
Sensor Type	
Source	
Latitude,Longitude	

INTERVAL:60-MIN	
Time	Hourly Count
0:00-1:00	90
1:00-2:00	52
2:00-3:00	39
3:00-4:00	31
4:00-5:00	92
5:00-6:00	263
6:00-7:00	710
7:00-8:00	985
8:00-9:00	1,020
9:00-10:00	811
10:00-11:00	772
11:00-12:00	730
12:00-13:00	812
13:00-14:00	802
14:00-15:00	869
15:00-16:00	1,034
16:00-17:00	1,086
17:00-18:00	1,035
18:00-19:00	902
19:00-20:00	736
20:00-21:00	622
21:00-22:00	474
22:00-23:00	299
23:00-24:00	179
<b>Total</b>	<b>14,445</b>
<b>AADT</b>	<b>14210</b>
<b>AM Peak</b>	08:00-09:00 1,020
<b>PM Peak</b>	16:00-17:00 1,086



# Volume Count Report

LOCATION INFO	
Location ID	2244
Type	LINK
Funct'l Class	-
Located On	DEQUINDRE
From Road	HAMLIN
To Road	AVON
Direction	2-WAY
County	Oakland
Community	Rochester
MPO ID	6370
HPMS ID	
Agency	Oakland County

COUNT DATA INFO	
Count Status	Accepted
Start Date	Mon 5/18/2015
End Date	Tue 5/19/2015
Start Time	11:00:00 AM
End Time	11:00:00 AM
Direction	
Notes	
Station	FO356_____
Study	
Speed Limit	
Description	
Sensor Type	
Source	
Latitude,Longitude	

INTERVAL:60-MIN	
Time	Hourly Count
0:00-1:00	76
1:00-2:00	29
2:00-3:00	27
3:00-4:00	22
4:00-5:00	56
5:00-6:00	201
6:00-7:00	663
7:00-8:00	985
8:00-9:00	894
9:00-10:00	591
10:00-11:00	523
11:00-12:00	523
12:00-13:00	554
13:00-14:00	595
14:00-15:00	665
15:00-16:00	938
16:00-17:00	1,064
17:00-18:00	1,087
18:00-19:00	953
19:00-20:00	584
20:00-21:00	513
21:00-22:00	354
22:00-23:00	245
23:00-24:00	142
<b>Total</b>	12,284
<b>AADT</b>	12930
<b>AM Peak</b>	07:00-08:00 985
<b>PM Peak</b>	17:00-18:00 1,087



# Volume Count Report

LOCATION INFO	
Location ID	659_NB
Type	SPOT
Funct'l Class	-
Located On	DEQUINDRE
SOUTH OF	23 MILE ROAD
Direction	NB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Thu 9/13/2018
End Date	Fri 9/14/2018
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	NB
Notes	
Station	659
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN					
Time	15-min Interval				Hourly Count
	1st	2nd	3rd	4th	
0:00-1:00	48	43	30	34	155
1:00-2:00	21	27	33	20	101
2:00-3:00	9	12	16	15	52
3:00-4:00	7	10	5	9	31
4:00-5:00	11	13	11	11	46
5:00-6:00	26	25	40	52	143
6:00-7:00	67	68	88	110	333
7:00-8:00	75	86	100	141	402
8:00-9:00	142	143	145	102	532
9:00-10:00	89	101	117	119	426
10:00-11:00	132	124	122	135	513
11:00-12:00	119	133	170	156	578
12:00-13:00	164	147	154	199	664
13:00-14:00	167	194	180	181	722
14:00-15:00	172	212	212	196	792
15:00-16:00	240	286	291	310	1,127
16:00-17:00	313	315	313	327	1,268
17:00-18:00	327	319	308	437	1,391
18:00-19:00	468	422	272	207	1,369
19:00-20:00	210	223	186	190	809
20:00-21:00	220	212	214	169	815
21:00-22:00	191	171	171	156	689
22:00-23:00	118	112	123	94	447
23:00-24:00	70	59	65	50	244
<b>Total</b>					13,649
<b>AADT</b>					
<b>AM Peak</b>					11:30-12:30 637
<b>PM Peak</b>					17:30-18:30 1,635



# Volume Count Report

LOCATION INFO	
Location ID	1059_SB
Type	SPOT
Funct'l Class	-
Located On	DEQUINDRE ROAD
NORTH OF	HAMLIN ROAD
Direction	SB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

COUNT DATA INFO	
Count Status	Accepted
Start Date	Thu 9/13/2018
End Date	Fri 9/14/2018
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	SB
Notes	
Station	1059
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN						
Time	15-min Interval				Hourly Count	
	1st	2nd	3rd	4th		
0:00-1:00	15	8	8	7	38	
1:00-2:00	8	2	5	7	22	
2:00-3:00	6	2	3	9	20	
3:00-4:00	0	5	10	1	16	
4:00-5:00	5	19	13	14	51	
5:00-6:00	41	37	51	68	197	
6:00-7:00	78	120	157	142	497	
7:00-8:00	187	187	170	157	701	
8:00-9:00	107	143	130	132	512	
9:00-10:00	138	107	134	100	479	
10:00-11:00	78	71	95	83	327	
11:00-12:00	68	67	74	76	285	
12:00-13:00	73	93	54	78	298	
13:00-14:00	76	91	67	105	339	
14:00-15:00	98	88	82	83	351	
15:00-16:00	74	67	86	80	307	
16:00-17:00	93	81	86	62	322	
17:00-18:00	80	82	92	129	383	
18:00-19:00	147	83	73	72	375	
19:00-20:00	63	78	75	53	269	
20:00-21:00	67	56	63	45	231	
21:00-22:00	30	33	25	25	113	
22:00-23:00	31	16	26	27	100	
23:00-24:00	13	22	14	13	62	
<b>Total</b>					6,295	
<b>AADT</b>						
<b>AM Peak</b>					07:00-08:00 701	
<b>PM Peak</b>					17:30-18:30 451	



# Volume Count Report

LOCATION INFO	
Location ID	173_WB
Type	SPOT
Funct'l Class	-
Located On	AVON
EAST OF	JOHN R
Direction	WB
County	Oakland
Community	-
MPO ID	
HPMS ID	
Agency	Oakland County - SCATS

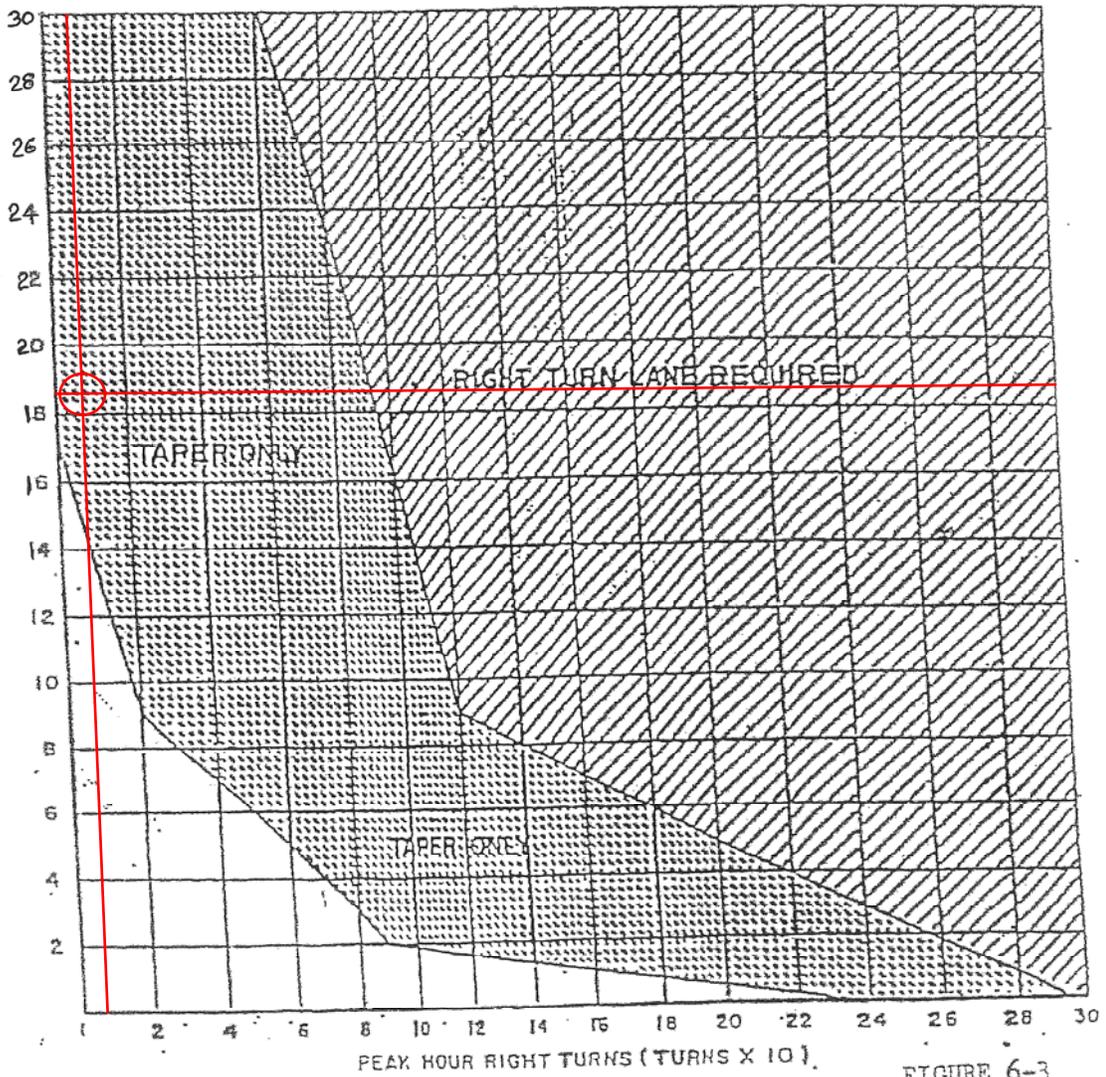
COUNT DATA INFO	
Count Status	Accepted
Start Date	Thu 9/13/2018
End Date	Fri 9/14/2018
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	WB
Notes	
Station	173
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN						
Time	15-min Interval				Hourly Count	
	1st	2nd	3rd	4th		
0:00-1:00	13	18	11	7	49	
1:00-2:00	4	5	9	2	20	
2:00-3:00	5	4	6	7	22	
3:00-4:00	0	4	9	9	22	
4:00-5:00	1	14	29	9	53	
5:00-6:00	40	55	98	88	281	
6:00-7:00	111	163	254	195	723	
7:00-8:00	193	243	189	174	799	
8:00-9:00	194	161	173	165	693	
9:00-10:00	133	134	133	97	497	
10:00-11:00	97	104	121	135	457	
11:00-12:00	99	112	134	105	450	
12:00-13:00	106	127	114	127	474	
13:00-14:00	126	130	118	110	484	
14:00-15:00	115	137	139	171	562	
15:00-16:00	127	140	154	160	581	
16:00-17:00	119	152	167	180	618	
17:00-18:00	187	138	139	148	612	
18:00-19:00	147	140	127	121	535	
19:00-20:00	119	124	115	108	466	
20:00-21:00	93	131	110	78	412	
21:00-22:00	90	96	95	85	366	
22:00-23:00	66	54	67	47	234	
23:00-24:00	43	32	36	16	127	
<b>Total</b>					9,537	
<b>AADT</b>						
<b>AM Peak</b>					06:30-07:30 885	
<b>PM Peak</b>					16:15-17:15 686	

# AVON ROAD & SITE DRIVE RIGHT TURN LANE WARRANT

FIGURE 6-3

## WARRANTS FOR RIGHT TURN DECELERATION LANE OR TAPER



2018 ADT: 17,779  
 + 0.5% growth to 2021 = 267  
+ 50% of Daily Site Trips = 433  
 = 18,479 2021 ADT

AM: 5  
 PM: 13

# AVON ROAD & SITE DRIVE LEFT TURN LANE WARRANT

FIGURE 6-2

## WARRANT FOR PERMITTING LEFT TURNS

(BASED ON TOTAL DEVELOPMENT)

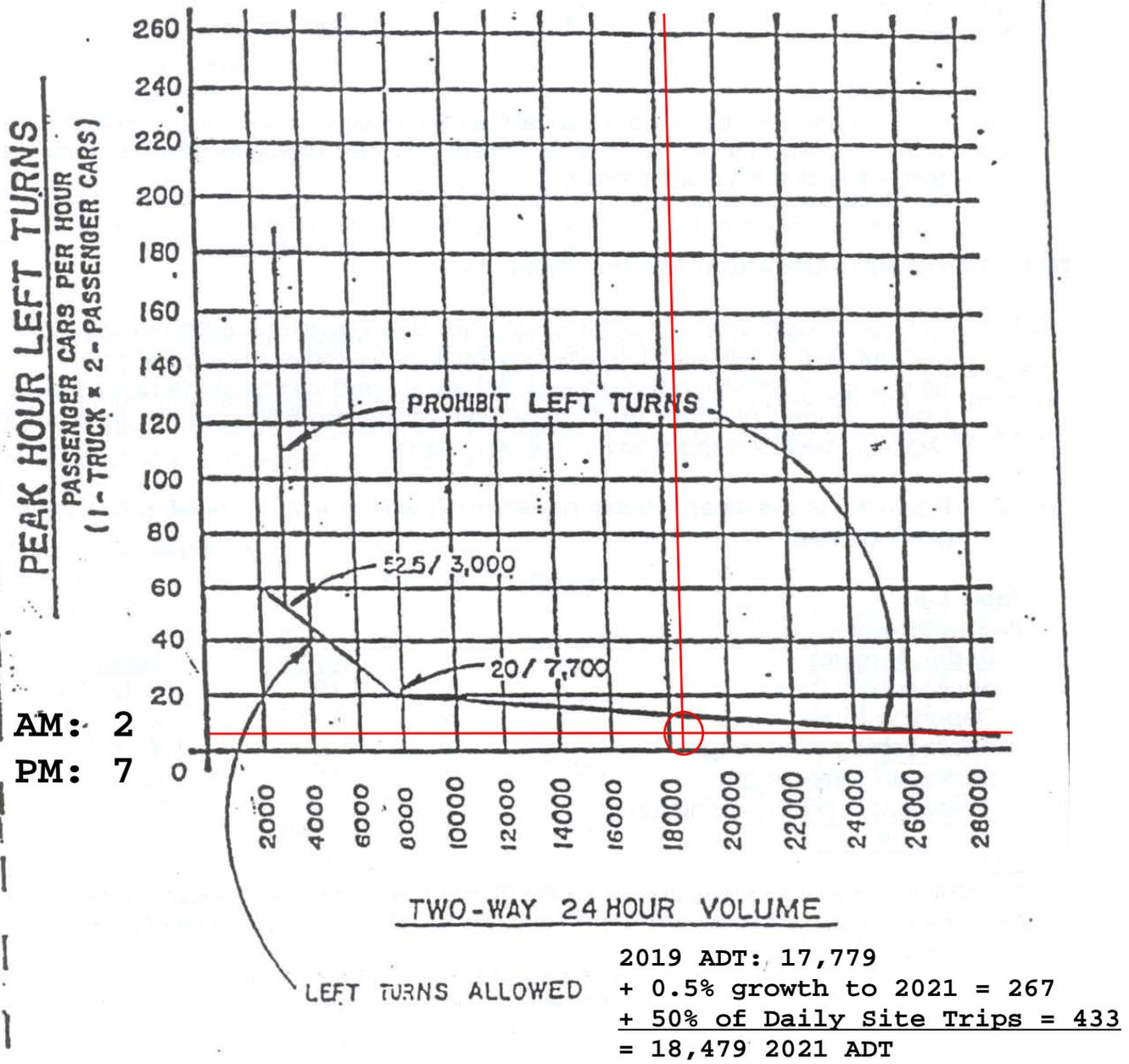


FIGURE 6-2

REVISED 8-6-79

# DEQUINDRE ROAD & SITE DRIVE RIGHT TURN LANE WARRANT

FIGURE 6-3

## WARRANTS FOR RIGHT TURN DECELERATION LANE OR TAPER

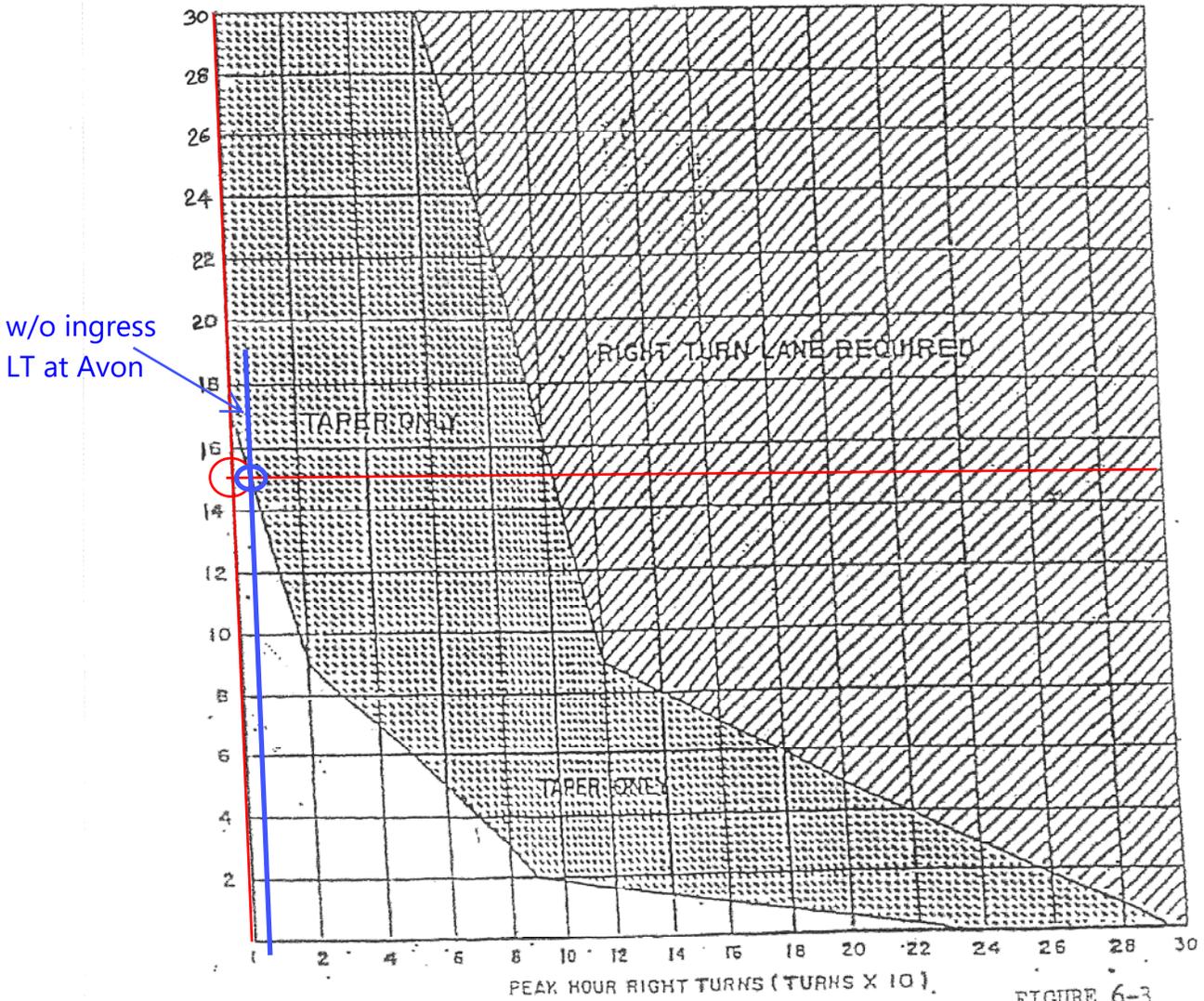


FIGURE 6-3

2019 ADT: 14,453  
 + 0.5% growth to 2021 = 217  
+ 50% of Daily Site Trips = 433  
 = 15,103 2021 ADT

AM: 1      3  
 PM: 6      13

w/o ingress LT at Avon

# DEQUINDRE ROAD & SITE DRIVE LEFT TURN LANE WARRANT

FIGURE 6-2

## WARRANT FOR PERMITTING LEFT TURNS

(BASED ON TOTAL DEVELOPMENT)

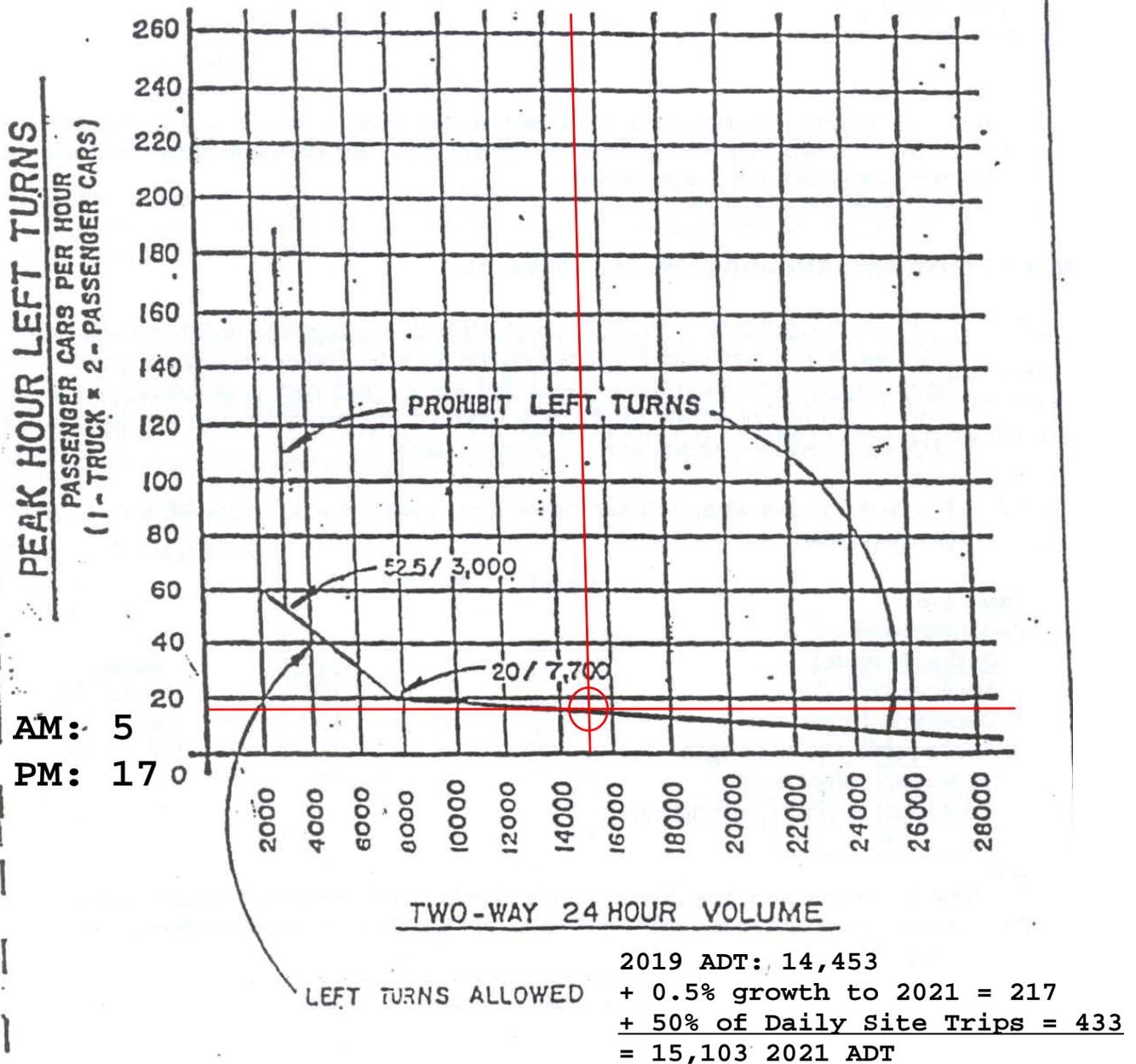


FIGURE 6-2

REVISED 8-6-79